PATENT ABSTRACTS OF JAPAN

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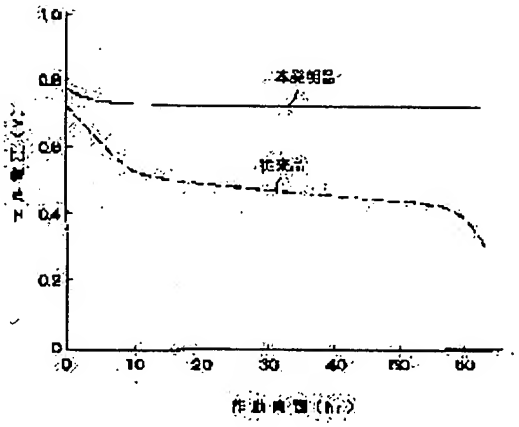
(54) FUEL ELECTRODE FOR SOLID ELECTROLYTE TYPE FUEL CELL

(57)Abstract:

PURPOSE: To increase thickness in a fuel electrode, enlarge a fuel cell, and prevent a cell voltage drop when gas leakage is caused in a part of electrolyte or the like.

CONSTITUTION: A fuel electrode is mainly composed of mixture formed by mixing monovalent metallic oxide (lithium oxide or silver oxide) and zirconia formed by adding yttria as a stabilizer in nickel oxide. Thereby, it follows that the monovalent metallic oxide is added to the nickel oxide acting as a P type semiconductor. Thereby, thickness of a fuel electrode is increased, or a fuel cell is enlarged, or an increase in resistance is restrained even when gas leakage is caused in a part of electrolyte, so that a cell voltage drop can be prevented.



The Figure shows a cell voltage changing condition when operated by setting current density for 200mA/cm2 at an operation temperature of 1000°C while creating a pin hole in electrolyte of each fuel cell of a product in the present invention and a conventional product.

LEGAL STATUS

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* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the fuel electrode for solid oxide fuel cells which can make the increment in the resistance small, if it says in more detail about the fuel electrode for solid oxide fuel cells.
[0002]
[Description of the Prior Art] Energetic researches and developments are furthered in that the hot added value and hot conversion efficiency of energy of a solid oxide fuel cell of using exhaust heat are high since operating temperature is about 1000 degrees C.
[0003] As structure of such a solid oxide fuel cell, although the cylinder single component form, the monolithic mold, etc. are known, the thing almost same as an ingredient of the air pole which constitutes a cell, an electrolyte, and a fuel electrode is used.
[0004] namely, LaMnO3 which added the calcium oxide or the strontium oxide as an air pole etc. -- mixture with the zirconia to which the zirconia to which the multiple oxide added stabilizing agents, such as an yttrium, an ytterbium, and calcium, as an electrolyte added nickel oxide and said stabilizing agent as a fuel electrode is used.
[0005] If oxygen and air which nickel oxide was returned, became the small nickel-YSZ cermet of resistance, carried out the operation as a negative electrode, and carried out the temperature up to this temperature when hydrogen and the carbon monoxide as a fuel which carried out the temperature up to the fuel electrode of a solid oxide fuel cell which consists of the above-mentioned ingredient at the operating temperature of about 1000 degrees C were supplied are supplied to an air pole, an air pole will carry out an operation of a positive electrode, and will operate as a cell.
[0006]
[Problem(s) to be Solved by the Invention] In the above-mentioned conventional fuel electrode for solid oxide fuel cells, when the thickness of a fuel electrode was made to increase, a fuel cell was enlarged and a gas leak occurred in electrolytic [some], it remained with the nickel oxide not returned mentioned above, and there was a problem that resistance of the fuel cell itself became large.
[0007]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the fuel electrode for solid oxide fuel cells of this invention is characterized by constituting as a subject the mixture which comes to mix the zirconia which added a univalent metallic oxide and a univalent stabilizing agent to nickel oxide.
[0008]
[work --] for Therefore, when a univalent metallic oxide will be added to the nickel oxide which acts as a P-type semiconductor, make the thickness of a fuel electrode increase, a fuel cell is enlarged or a gas leak occurs in electrolytic [some], this invention can control the increment in resistance, even if oxygen tension becomes large from the balanced oxygen tension of nickel oxide to metal nickel under operating temperature and metal nickel oxidizes conversely.

[0009]
[Example] Explanation of an example is preceded. the nickel oxide whose purity is 99.9% -- a lithium carbonate -- 1.5-mol % -- Li0.03 added and produced When the direct-current conductivity in the inside of the 1000-degree C air of nickel0.97O and the direct-current conductivity in the inside of the 1000-degree C air of nickel oxide same as the above are measured with a four probe method Former 2.0x10-2 To being omegacm, as for the latter, it turns out that it is 13-ohmcm, and by adding a univalent metallic oxide to nickel oxide shows that reduction in resistance can be aimed at.
[0010] In addition, although the above-mentioned case was making lithium oxide dissolve in nickel oxide by adding a lithium carbonate to nickel oxide, the same result was obtained, even if it may mix lithium compounds other than a lithium carbonate and mixed other univalent metallic oxides other than a lithium like the silver oxide.
[0011] Moreover, if the addition of the lithium oxide to nickel oxide or a silver oxide is 0.01-mol %, in order to be spread in an electrolyte and to make it not reduce electrolytic ion conductivity although it can contribute to reduction in resistance, it is good less than [10 mol %] and to make it preferably about 1-3 mol %.
[0012] Next, zirconia powder, water which added the yttria as a stabilizing agent, The crevice of a plaster mold is filled with the electrolyte slurry which consists of a binder, a dispersant, and a defoaming agent. After removing an excessive electrolyte slurry after carrying out fixed time amount neglect, and forming an electrolyte Plastic solid, The fuel electrode slurry which consists of the nickel oxide which added the 1.5-mol % of lithium carbonate, fully stabilized zirconia, water, a binder, a dispersant, and a defoaming agent is poured out on said electrolyte Plastic solid, after carrying out fixed time amount neglect, an excessive fuel electrode slurry is removed and a fuel electrode Plastic solid is formed.
[0013] And LaMnO3 which removed the composite molding object with which the electrolyte Plastic solid and the fuel electrode Plastic solid were united from the plaster mold, calcinated under the temperature of 1200 degrees C - 1500 degrees C, considered as electrolyte-fuel electrode complex, and added the strontium oxide on the front face by the side of the electrolyte of this electrolyte-fuel electrode complex The air pole slurry to contain was applied and the solid oxide fuel cell which can be burned at 1100 degrees C - 1300 degrees C, forms an air pole, and has the fuel electrode of this invention was produced.
[0014] The solid oxide fuel cell which has the conventional fuel electrode by the same approach on the other hand using the fuel electrode slurry which does not add a lithium carbonate was produced.
[0015] In this way, the electrolyte of each obtained cell is made to produce a pinhole, and it is current density under the operating temperature of 1000 degrees C 200 mA/cm2 It carries out, change of the cel electrical potential difference at the time of making it operate is investigated, and a result is shown in drawing 1 .
[0016] The solid oxide fuel cell which has the conventional fuel electrode from drawing 1 to the solid oxide fuel cell which has the fuel electrode of this invention having not almost had the fall of a cel electrical potential difference has the fall of a cel electrical potential difference, and it turns out that the fuel electrode of this invention can control the increment in resistance by oxidation of nickel.
[0017]
[Effect of the Invention] As described above, the fuel electrode for solid oxide fuel cells of this invention can control the increment in resistance by oxidation of metal nickel, and can prevent the fall of the cel electrical potential difference of a cell.

[Translation done.]